Version 6

FIG. 9 illustrates a sixth embodiment of the invention. Spindle **56***e* is provided with a circumferential groove **96**, a portion of which has splines **97**. A coupler **60***e* is designed to slide over the end of the spindle and is then formed to match the splines **97** and to fit the smaller diameter of groove **96**. In the process, the coupler is pressed axially against the bearing to preload the bearing and lock the bearing in place. External splines **98** are subsequently formed into the coupler for engagement by the clutch ring.

Version 7

FIG. **10** illustrates a seventh embodiment of the invention. The spindle **56***f* is provided with fingers or dogs **100**. Coupler **60***f* has mated fingers **102** that interlock with the fingers of the spindle (See FIG. **10***a*) and the protruding end **104** of the fingers **102** are then flattened in the manner of a rivet to secure the coupler and in the process preload the bearing **54**.

Version 8

FIG. **11** illustrates an eighth embodiment of the invention. The spindle **56***g* is provided with splines **106** and a coupler **60***g* having mated splines **108** is slid onto the splines and is compressed against the bearing **54**. A space between splines **106, 108** is filled with molten metal **110** to lock the coupler to the spindle and retain the preload against the bearing.

Version 9

FIG. **12** illustrates a ninth embodiment of the invention. The spindle **56** is configured at end **61***h* to mate with the configuration of coupler **60***h*. The positioning of the bearing **54** is such that with the coupler abutted against the end **61***h*, the bearing is desirably preloaded. Coupler **60***h* is then spin welded (friction welded) to the end **61***h*. FIG. **12***a* shows a variation of the same embodiment. FIG. **12***b* is also a variation of the same embodiment. Here the coupler is slid onto the spindle end and the configuration of the coupler **60***h*" provides a slot **112** in which a separate ring **114** is positioned and spin welded. The version of FIG. **12***b* permits the use of a spline fit as indicated by reference **113**.

Version 10

FIGS. **13**, **13***a* and **13***b* are similar to FIGS. **12***a* and **12***b*. The coupler **60***i*, **60***i*', **60***i*" is configured to match the ends **61***i*, **61***i*' and **61***i*" of the spindle **56** and the spindle and coupler are welded together following preload, as indicated by weld joints **116**. The coupler may also be spline fit as indicated at **117** in FIG. **13**. Also, a relief space **119** is exaggerated to demonstrate that the coupler **60***i* is abutted/compressed against race **54**.

Version 11

FIG. **14** illustrates an eleventh embodiment of the invention. A coupler **60***j* is spline fit to the spindle **56***j*. The inner diameter **118** of the spindle end **61***j* is provided with screw threads with mated screw threads provided on retainer **120**. A lock washer **122** is fitted between the retainer **120** and coupler **60***j*. A washer suitable for this purpose is disclosed in U.S. Pat. Nos. 5,772,373 and 5,618,143.

FIG. **14***a* shows the concept of FIG. **14** but applied to the outboard end of spindle **36***j*'.

Version 12

FIGS. **15** and **15***a* illustrate a twelfth embodiment of the invention. A coupler **60***k* is mounted to spindle **56***k*. End **61***k* is roll formed against the coupler **60***k* to provide the desired preload on bearing **54**. Coupler **60***k* is engaged by the clutch ring **68** to provide driving engagement between the axle **32** and the spindle/wheel hub extension **56***k*. To insure driving engagement as between the coupler and spindle **56***k*, the coupler and spindle have mated polygonal configurations **124, 126** as illustrated in FIG. **15A**. Whereas a hexagonal configuration is shown, other polygonal shapes will be equally satisfactory and including other interlocking shapes such as a double D shape.

FIGS. **16** and **16***a* illustrate a final and thirteenth embodiment of the invention. Here the spindle end **61***m* is provided with an outer diameter **128** that is configured to have a larger diameter than that of coupler **60***m* which is force fit onto the end **61***m*, e.g., by heating the coupler relative to the spindle and forcing the coupler onto the spindle and against the bearing **54** so that when cooled the coupler incurs a tight and secure fit to the spindle. The outer diameter **128** may also be provided with a negative angle to enhance the tight fit. FIG. **16***a* illustrates a variation to the force fit by press fitting a dowel **130** into aligned holes **132, 134** in the spindle and coupler, respectively.

The above embodiments provide a number of benefits that will be apparent to those skilled in the art. Whereas the embodiments and variations are numerous, they are not all encompassing and further variations will become obvious. Accordingly, the invention is not limited to the above disclosures but is determined by the definitions provided in the accompanying claims.

The invention claimed is:

1. A wheel end assembly for a vehicle having optional four-wheel/two-wheel drive comprising:

a wheel hub having an inwardly extending spindle portion configured to have an inboard end and a shoulder spaced outwardly of said inboard end;

a wheel bearing mounted on said spindle portion for rotatably mounting said wheel hub to a vehicle chassis, said wheel bearing having an outboard end abutted against the shoulder;

said inboard end of said spindle portion roll formed against an inboard end of said bearing and producing thereby a desired preload on said bearing and securement of said preload;

said spindle portion at said inboard end being cylindrical to define an inner wall configured to provide a securement feature, a coupler having an outer diameter fitted to the inner wall and mated to the securement feature to provide common rotation of the coupler and the spindle, said coupler having an inboard end protruded from the inboard end of the spindle;

an axle portion positioned adjacent the inboard end of the coupler and rotatable relative to the coupler and defining thereby adjacent portions of the axle portion and coupler, splines provided on the adjacent portions and a spline engaging clutch ring slidable between engagement with one and engagement with both the splines of the adjacent portions.

2. A wheel end assembly as defined in claim **1** wherein the coupler is cylindrical and in cooperation with the wheel hub defines a cylindrical support, said axle portion extended into said cylindrical support and a bearing provided in said cylindrical support for relative rotation of the axle portion.

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